METHOD, SYSTEM, PROGRAM AND MEDIUM FOR DISPLAYING READ IMAGE

BACKGROUND OF THE INVENTION

5   Field of the Invention

The present invention relates to a technology for improving visibility of an image when image information of a read film original is displayed.

Related Background Art

10   In flat bead type image reading apparatuses that have been developed in recent years, when a strip of 35mm film is to be read, the strip is set along the sub scanning direction of the image reading apparatus due to limitations of space. In other

15   words, a strip of 35mm film is read under the state in which its long side is oriented in the sub scanning direction. However, the general trend is that when the read image is displayed on a display device of a computer, preview display for a

20   transparent original is performed in the form of thumbnail type display that is similar to the index print for the APS film, in order to improve ease of operation by users. Therefore, when thumbnails of a 35mm film strip are displayed, the image that has

25   been read along the longitudinal direction is rotated by 90 degrees, since horizontal display is better in terms of visibility.

However, a 35mm film slide with a mount, a Brownie film, or 4x5 inch film can be set in the above-described image reading apparatus without paying attention to the orientation of the film. On the other hand, in the conventional image reading apparatus, thumbnails are displayed in the state in which read image is rotated by 90 degrees in order to improve ease of user's operation of thumbnails for a 35mm film strip. Consequently, when a 35mm film with a mount, a Brownie film or a 4x5 inch film is set in the image reading apparatus in a landscape (or horizontal) orientation, it is also rotated by 90 degrees and displayed in a portrait (or vertical) orientation. This deteriorates visibility and user operability.

In the conventional image reading apparatus, a film guide is generally used in order to set films in the apparatus correctly. However, when films are set in the image forming apparatus without the film guide, there might be a mixed situation in which some films are placed in a portrait orientation and some films are placed in a landscape orientation. In that case, images placed in a portrait orientation and images placed in a landscape orientation are mixed in the thumbnail display. This situation is undesirable from the view point of appearance or operability.

SUMMARY OF THE INVENTION

An object of the present invention is to make it possible to rotate and display image information of originals in an easily viewable orientation for users irrespective of the orientation of the originals set on an original support.

To achieve the above object, the apparatus for reading images according to the present invention is constituted as follows.

[1] A method of reading an original placed on an original support and displaying it, comprising an image reading step of reading an image of the original placed on the original support to generate an image signal, a placement orientation detection step of detecting placement orientation of said original based on the image signal generated in said image reading step, an image signal rotation step of rotating, when the placement orientation of said original detected in said placement orientation detection step is different from a predetermined orientation, said image signal to said predetermined orientation, and a read image signal display step of displaying the read image signal in an orientation aligned with a predetermined orientation.

[2] A method of displaying image information, wherein when image information of an original that is different in its horizontal length and vertical

length placed on an original support is read by an image reading apparatus and said read images are displayed on a display apparatus in a thumbnail display form, placement orientation of said original

5   placed on said original support is detected and said image information is displayed in a state in which a horizontal or vertical direction of the image information of said original is aligned in a predetermined orientation irrespective of the

10   detected placement orientation of said original.

[3]   A system for displaying image information, wherein when image information of an original that is different in its horizontal length and vertical length placed on an original support is read by an

15   image reading apparatus and said read image is displayed on a display apparatus in a thumbnail display form, placement orientation of said original placed on said original support is detected and said image information is displayed in a state in which a

20   horizontal or vertical direction of the image information of said original is aligned in a predetermined orientation irrespective of the detected placement orientation of said original.

[4]   A program for carrying out a method of

25   displaying image information as set forth in the above paragraph [3] under a control by a computer.

[5]   A computer-readable recording medium in

which a program set forth in the above paragraph [4] is stored.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross sectional view schematically showing the hardware structure of an image reading apparatus according to an embodiment of the present invention.

Fig. 2 is a block diagram showing the functional arrangement of the image reading apparatus according to the embodiment of the present invention.

Fig. 3 illustrates an example of placement of films on an original support of the image reading apparatus.

Fig. 4 illustrates an example of a screen of an operating portion of a driver software for controlling the image reading apparatus through a host computer.

Fig. 5 is a flow chart of a control process of an image reading operation of the image reading apparatus according to the embodiment of the present invention.

Fig. 6 illustrates an example of a screen of an operating portion of a driver software for controlling the image reading apparatus through a host computer according to a modification of the embodiment of the present invention.

Fig. 7 illustrates an example of image display by the driver software for controlling the image reading apparatus through a host computer according to the modification of the embodiment of the present

5   invention.

Fig. 8 illustrates another example of image display by the driver software for controlling the image reading apparatus through a host computer according to the modification of the embodiment of

10   the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following, a preferred embodiment of the present invention will be specifically described with

15   reference to the accompanying drawings.

Fig. 1 is a cross sectional view schematically showing the hardware structure of an image reading apparatus as an embodiment of the present invention. In Fig. 1, reference numeral 1 designates a body of a

20   scanner, reference numeral 2 designates a unit for transparent original and reference numeral 3 designates an original to be read. The scanner 1 is connected with a host computer (which will be simply referred to as a host hereinafter) via an interface

25   cable. The scanner 1 is provided with a movable optical unit 4, an original support glass 5, an electric circuit board 6, a pulse motor 7, an endless

belt 8, pulleys 9 and 10, a gear train 11, a guide
rail 12 and a white reference plate 13. The white
reference plate 13 has a black mark 36 formed thereon.
The scanner 1 determines a reading area utilizing

5   that black mark 36 as a reference to read an image.
Connections to the optical unit 4 and the pulse motor
7 are respectively made by cables that are not shown
in the drawings. The optical unit 4 is mounted on
the guide rail 12 with mounting means in such a way

10 that the optical unit 4 can slide on the guide rail
12. The mounting means 14 is secured to the endless
belt 8. The movable optical unit 4 is composed of a
light source for reflective original 15, a plurality
of reflecting mirrors 16, 17 and 18, an imaging lens

15 19 and a line sensor 20 serving as image pickup means.
     Firstly, a reflective original reading
operation of the scanner 1 will be briefly described.
The reading operation of the scanner 1 is stared in
response to a read command from the host. The

20 scanner 1 turns on the light source for reflective
original 15 and light reflected from an original is
reflected by the plurality of mirrors 16, 17 and 18
and focused on the sensor 20 via the imaging lens 19,
so that one line image along the main scanning

25 direction is read. The endless belt 8 is driven by
the pulley 9 that is rotated by the driving force of
the pulse motor 7 transmitted via the gear train 11.

Thus, the optical unit 4, which is fixed to the endless belt 8 by the mounting means 14, is moved on the guide rail 12 in the sub scanning direction indicated by arrow X.

5　　　　The scanner 1 repeats the aforementioned reading of line image along the main scanning direction while moving the optical unit 4 in the sub scanning direction. The scanner 1 moves the optical unit 4 shown in Fig. 1 up to the position shown by

10　　the broken line while performing the reading operation, so that the whole area of the original support glass 5 can be scanned. However, a partial area image of the original support glass can be read in accordance with the content of a command from the

15　　host. When only a partial area image is to be read, with respect to the main scanning direction, the sensor output is restricted to a pixel area to be used by control means provided on the electric circuit board that will be described later, and with

20　　respect to the sub scanning direction, the moving area of the optical unit 4 is restricted by the control means.

　　　　Next, a transparent original reading operation of the scanner 1 will be briefly described. The

25　　scanner 1 turns off the light source for reflective original 15 and turns on a light source for transparent original 35. The scanner 1 moves the

optical unit 4 to a position suitable for reading transparent originals. Thus, transmitted light from the light source for transparent original 35 is reflected by the plurality of mirrors 16, 17 and 18

5 and focused on the sensor 20 via the imaging lens 19, so that one line image along the main scanning direction is read. The endless belt 8 is driven by the pulley 9 that is rotated by the driving force of the pulse motor 7 transmitted via the gear train 11.

10 Thus, the optical unit 4, which is fixed to the endless belt 8 by the mounting means 14, is moved on the guide rail 12 in the sub scanning direction indicated by arrow X.

The scanner 1 repeats the aforementioned

15 reading of line image along the main scanning direction while moving the optical unit 4 in the sub scanning direction. The scanner 1 moves the optical unit 4 shown in Fig. 1 up to the position shown by the broken line while performing the reading

20 operation, so that the whole area of the original support glass 5 can be scanned. However, a partial area image of the original support glass can be read in accordance with the content of a command from the host. When only a partial area image is to be read,

25 with respect to the main scanning direction, the sensor output is restricted to a pixel area to be used by control means provided on the electric

circuit board that will be described later, and with respect to the sub scanning direction, the moving area of the optical unit 4 is restricted by the control means.

5   There are plural predetermined speeds for moving the optical unit 4 in the sub scanning direction, and a system controller 26 selects an appropriate speed to perform image reading based on the image reading setting designated by the host.

10   In the following, functional blocks of the scanner will be described with reference to Fig. 2.

Referring first to the optical unit 4, reference numeral 24 designates a light source lighting circuit for turning the light source for

15   reflective original 15 and light source for transparent original 35 on. The light source lighting circuit 24 includes detection means for detecting light quantity of the light sources. In addition, the light source lighting circuit 24

20   switches the light source for reflective original 15 and light source for transparent original 35. In the case that cold cathode tubes are used as the light source for reflective original 15 and light source for transparent original 35, the lighting circuit 24

25   is constructed as a so-called inverter circuit.

In the electric circuit board 6, reference numeral 25 designates a motor driving circuit for

driving the pulse motor 7. The motor driving circuit 25 outputs an excitation switching signal for the pulse motor 7 based on a signal from the system controller 26 serving as system control means of the

5   scanner 1. Reference numerals 27R, 27G and 27B designate analogue gain adjusters that are capable of amplifying analogue signals output from the line sensor 20 with a variable gain.

Reference numeral 28 designates an A/D

10   converter for converting the analogue image signal output from the variable analogue gain adjuster 27 into a digital image signal. Reference numeral 29 designates image processing means for effecting an image process on the digitized image signal, such as

15   offset correction, shading correction, digital gain adjustment, color balance correction, masking, resolution conversion in the main and sub scanning directions, or image compression. Reference numeral 30 designates a line buffer for storing image data

20   temporarily. The line buffer 30 is composed of a general purpose random access memory.

Reference numeral 31 designates an interface portion for allowing communication with the host 21. Although a USB interface is adopted in the interface

25   portion 31 of this apparatus, different interfaces such as an IEEE1394 interface may also be used. Reference numeral 32 designates an offset RAM to be

used as a working area of the image processing process. The offset RAM 32 is used for compensating RGB interline offsets for the line sensor 20 in which line sensors for R, G and B are arranged in parallel

5   with each other with predetermined offsets. In addition, the RAM 32 temporarily stores various data for shading correction, etc. In this apparatus the RAM 32 is composed of a general purpose random access memory.

10   Reference numeral 33 designates a gamma RAM that stores gamma curves for effecting gamma correction. Reference numeral 26 designates a system controller in which all the sequences of the scanner are stored. The system controller 26 effects various

15   controls based on commands from the host 21. Reference numeral 34 designates system buses for connecting the system controller 26, the image processing means 29, the line buffer 30, the interface portion 31, the offset RAM 32 and the gamma

20   RAM 33. The system bus 34 is composed of an address bus and a data bus.

In the following, an example of a state in which films are set in the image reading apparatus will be described with reference to Fig. 3.

25   In Fig. 3, reference numeral 37 designates an original support of the image reading apparatus on which films are placed while they are read in the

horizontal main scanning direction and in the
vertical sub scanning direction. Reference numerals
38 and 40 designate mounts for a 35mm film, while
reference numerals 38 and 39 designate 35mm films.

5   Reference numerals 38 and 39 designate an example a
35mm film that is set in a landscape orientation (i.e.
horizontal orientation) in the image reading
apparatus, while reference numerals 40 and 41
designate an example of a film that is set in a

10   portrait orientation (i.e. vertical orientation) in
the image reading apparatus. Since the films are
read from the original support side, the films should
be placed in such a way that they are like mirror
images as seen from above. Films are sometimes

15   placed on the original support of the image reading
apparatus in such a mixed manner in which some films
are oriented in the landscape manner and other films
are oriented in the portrait manner. In addition,
what will be placed on the original support is not

20   only 35mm films but also Brownie films and 4x5 inch
films, etc.

Next, an example of an operating portion of a
driver software for controlling the image reading
apparatus on the host 21 will be described in the

25   following with reference to Fig. 4.

Reference numeral 42 designates a menu for
selecting the scheme of image reading of the image

reading apparatus. A user can select, as the image
reading scheme of the image reading apparatus, either
reading of reflective original or reading of
transparent film original. Reference numeral 43

5   designates a menu for selecting the type of the
original. With this menu, the user selects either
negative film or positive film as the object whose
image is to be read into the host 21. Reference
numeral 44 designates a button for displaying the

10   images to be read into the host 21 in the area 46.
This relates to a process in which provisional images
(or preview images) are read for applying image
processing before an image(s) is read into the host
21. Reference numeral 45 designates a button for

15   reading an image(s) into the host 21. With operation
of this button, reading of an image(s) into the host
is started. Reference numeral 46 designates
thumbnail display of the films. In this thumbnail
display, the films set on the original support of the

20   image reading apparatus in a mixed manner with the
landscape orientation and the portrait orientation
are displayed uniformly in the landscape orientation.

In the following, a control process of image
reading operation according to this embodiment will

25   be described with reference to Fig. 5.

The power of the scanner 1 is turned on (step
1). At that time, initialization of the scanner

including determination of an image reading reference

position of the scanner 1 and other processes is

performed, so that the scanner is brought into a

state capable of performing image reading. A driver

5   software for the scanner 1 is activated in the host

21 that controls the scanner 1 (step 2). Upon

depression of the preview button 43, the scanner 1

reads an image of the whole area of the original

support 37 (step 3).

10   Then, frames of the films are cut out (or

profiled) from the image read in step 3. During this

process, how many frames of films are present on the

original support 37 is detected, and the coordinate

position of each frame and the length of the

15   horizontal and vertical sides of each film frame are

also detected (step 4). When it is determined that

the number of the frames of the films is not zero

(step 5), the process proceeds to step 6, in which

the length of the horizontal side and the length of

20   the vertical side of each frame detected in step 4

are compared (step 6). When it is determined that

the horizontal size is larger than the vertical size,

the process proceeds to step 7, in which a thumbnail

of the film is displayed as it is (step 7). When it

25   is determined that the horizontal size is smaller

than the vertical size, the process proceeds to step

8, in which a thumbnail of the film is displayed in

the state the film image is rotated by 90 degrees

(approximately 90 degrees speaking strictly, since

the inclination of the film is also corrected to

erect the image in the case that the film is placed

5   with a little inclination) (step 8). The process of

step 5 and after is repeated the number of times

corresponding to the number of the frames of the

films (step 9).

With the above-described process, it is

10   possible to provide an image reading apparatus that

can display a thumbnail(s) without depending on the

orientation of a film(s) set in the image reading

apparatus by a user, without an increase in the cost

and without modifying the structure of the

15   conventional image reading apparatus.

Next, an modification of the above-described

embodiment will be described with reference to Fig. 6.

Some users prefer that when mounted films are

placed on the original support as shown in Fig. 3,

20   the films are read and displayed as they are. In

addition, all the frames may be displayed in a

portrait orientation. The modification accommodates

these display options. In this modification, a

selection menu 47 for image display direction is

25   added to the selection menus for reading scheme shown

in Fig. 4. In this selection menu, the modes

"display based on reading direction", "display all

frames by rotating them by 90° leftward", "display all frames in landscape manner" and "display all frames in portrait manner" can be selected in relation to the reading direction. In the case that

5   the mode "display all frames in landscape manner" is selected, the thumbnails are displayed in the manner shown in Fig. 4. In the case shown in Fig. 6, the mode "display based on reading direction" is selected by the popup menu, so that the thumbnails in the

10   display area 46 are displayed in the orientation as they are read. Fig. 7 illustrates a display under the mode "display all frames by rotating them by 90° leftward". The apparatus may also be designed in such a way that each frame can be selected to be

15   rotated or inverted horizontally or vertically so as to be displayed.

In the case that all the frames are displayed in the landscape manner, the margins can be made small as shown in Fig. 8, so that an increased number

20   of images can be displayed in one screen.

As has been described above, according to the embodiment, cutting-out of effective image areas is performed after films are set in the image reading apparatus and an image of the whole area of the image

25   reading apparatus is read, and the size of the effective areas thus cut out is detected. Based on the size detection, the horizontal size and the

vertical size of each effective image area are
compared, and it is determined based on the result of
this comparison whether the image is to be displayed
after rotated by 90° or displayed as it is in the

5 thumbnail display. With the above features, it is
possible to provide an image reading apparatus that
can display a thumbnail(s) without depending on the
orientation of a film(s) set in the image reading
apparatus by a user, without an increase in the cost

10 and without modifying the structure of the
conventional image reading apparatus. In addition, a
driver software having an excellent availability or
operability can be provided for users.

It is apparent that the object of the present

15 invention can also be attained by feeding a system or
an apparatus with a storing medium in which a program
code of a software that realizes the above-described
functions of the embodiment is stored to cause that
system or computer (or CPU or MPU) to read the

20 program code stored in the storing medium to execute
it.

In this case, the program code read out from
the storing medium itself realizes the above-
described functions of the embodiment, and therefore

25 the program code per se or the storing medium that
stores the program code constitutes the subject of
the present invention.

The storing medium for providing the program code may include a flexible disk, a hard disk, an optical disk, and magneto optical disk, a CD-ROM, a CD-R, a magnetic tape, a nonvolatile memory card, or a ROM, etc.

It should be understood that the present invention covers not only the case in which the above-described functions of the embodiment is realized by execution of a program code read by a computer but also the case in which a part or all of the process is executed by an OS (i.e. a basic system or an operating system) running on the computer based on a command(s) by the program code so that the above-described functions of the embodiment are realized by that process.

In addition, it should also be understood that the present invention covers the case in which a program code read out from a storing medium is written in a memory provided in a function extension board inserted in a computer or a function extension unit connected to the computer and a part or all of the actual process is executed by a CPU or the like provided in the function extension board or the function extension unit so that the above-described functions of the embodiment are realized by that process.